IMAGE-BASED SIMULATION
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ABSTRACT

Advances in three-dimensional imaging techniques, including x-ray computed tomography and scanning electron microscopy, have enabled insight into as-manufactured materials and components like never before. This abundance of image data has inspired scientists and engineers to perform simulations on computational domains derived directly from this image data, a foundational aspect of the increasingly popular digital twin concept. However, the process converting greyscale three-dimensional image data to a discretized domain suitable for simulation is often arduous and fraught with errors.

In this minisymposium, we explore techniques for improving this image-to-simulation process. Topics of interest include, but are not limited to:

- Computed tomography reconstruction techniques to reduce artifacts
- Image segmentation, labeling, and part identification
- Computer vision and machine learning approaches
- Geometric feature identification and detection
- Domain discretization / mesh generation
- Data compression and model reduction
- Methods for incorporating residual stress and initial internal material state
- Algorithms and numerical methods for solving multi-physics problems on image data
- High performance computing applied to image datasets
• Applications of the above techniques to real-world scientific and engineering applications
• Credibility assessments, including uncertainty quantification and validation